UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

June 26, 2002

John Newcom
Okanogan National Forest
Methow Valley Ranger District
P.O. Box 188
Twisp, Washington 98856

Re: Biological Opinion and Essential Fish Habitat Consultation for the Twisp River Watershed Culvert Replacements (NMFS No. WHB-02-190)

Dear Mr. Newcom:

The attached document transmits the National Marine Fisheries Service's (NMFS) Biological Opinion (BO) on the proposed Twisp River Watershed Culvert Replacements in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531). The Forest Service has determined that the proposed action was likely to adversely affect the Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) Evolutionarily Significant Unit (ESU) and UCR spring chinook (*Oncorhynchus tshawytscha*) ESU. Formal consultation was initiated on May 13, 2002.

This BO reflects formal consultation and an analysis of effects covering the UCR steelhead and UCR spring chinook in the Twisp River and its tributaries near Twisp, Washington. The BO is based on information provided in the biological assessment sent to NMFS by the Forest Service on April 10, 2001, the Addendum to the BA dated May 8, 2002, as well as subsequent information transmitted by telephone conversations and electronic mail. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office.

NMFS concludes that the implementation of the proposed project is not likely to jeopardize the continued existence of UCR steelhead or UCR spring chinook. Please note that the incidental take statement, which includes reasonable and prudent measures and terms and conditions, was designed to minimize take. If you have any questions, please contact Justin Yeager of the Washington State Habitat Branch Office at (509) 925-2618.

Sincerely,

for Michael R Course

D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation

Biological Opinion

And

Magnuson-Stevens Fishery Conservation and Management Act

Twisp River Watershed Culvert Replacements
Okanogan County, Washington
WHB-02-190

Agency: United States Department of Agriculture, Forest Service

Consultation Conducted By: National Marine Fisheries Service,
Northwest Region

Issued by: F.r Michael R Crouse
D. Robert Lohn
Regional Administrator

Date: July 1, 2002

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1.0 INTRODUCTION

1.1 Background and Consultation History

On April 10, 2001, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) from the Forest Service. NMFS replied with correspondence dated November 5, 2001 informing the Forest Service that culvert replacements will require formal consultation. On May 10, 2002, NMFS received an addendum to the BA covering the replacement of four culverts and a request for Endangered Species Act (ESA) section 7 formal consultation. Formal consultation was initiated on May 13, 2002. The proposed action is the replacement of four culverts in the Twisp River Watershed.

The proposed project area occurs within the Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) Evolutionarily Significant Unit (ESU) and UCR spring chinook (*Oncorhynchus tshawytscha*) ESU. The Forest Service has determined that the project "may affect, and is likely to adversely affect" UCR steelhead and UCR spring chinook. After reviewing the BA and addendum, NMFS agrees with this conclusion.

The objective of this Biological Opinion (BO) is to determine whether the proposed project is likely to jeopardize the continued existence of UCR steelhead or UCR spring chinook. The standards for determining jeopardy are described in section 7(a)(2) of the ESA and further defined in 50 C.F.R. 402.14. This BO is based on the information presented in the BA, the addendum to the BA, phone conversations, and electronic mail correspondence. This document also presents NMFS' consultation covering Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

1.2 Description of the Proposed Action

The Forest Service proposes to replace four culverts on tributaries to the Twisp River over the next three years. The four culverts are located on North, Scatter, Eagle, and War Creeks. This project will replace existing culverts that impede fish passage, with open bottom arched culverts. The new structures will partially restore natural channel processes and pass 100-year flood events. Each culvert replacement may include the following: removal of vegetation, installation of sedimentation reduction devices, construction of a stream bypass channel, excavation and removal of the old culvert, diversion of the stream into a bypass channel, herding and removal of fish from the project area, excavation of the stream channel, construction of an open bottom arched culvert, diversion of the stream back into the main channel, reconstruction of the road, revegetation with native plants and shrubs, and implementation of measures designed to minimize impacts to salmonids.

In addition to the four culvert replacements, the Forest Service will be removing four sill logs and a small amount of riprap in War Creek. Both are located immediately downstream of the junction of War Creek and Forest Service Road 4420. The sill logs are low flow barriers and are becoming undermined, further complicating upstream fish passage. Removal of the sill logs will restore fish passage and natural processes. The riprap is constraining the channel and blocking

flow through a natural distributive channel. The removal should reestablish a natural bank configuration and restore natural processes to the adjacent riparian area.

The Forest Service has proposed 23 conservation measures or Best Management Practices (BMP's) to minimize and avoid negative effects to listed salmonids. These conservation measures will be required elements of each proposed project, and the analysis in the BO assumes the measure will be used as described.

General Mitigation Measures:

- The Forest Service will notify District and NMFS fisheries biologists prior to construction for each project.

- The Forest Service will notify District and NMFS fisheries biologists two days before isolating the work area from flow.

- Disturbance of stream channels will be minimized and will be restored to the natural configuration at completion of the project.

- The project work window will be from late July through early August to avoid spawning and incubation periods for UCR steelhead and UCR spring chinook.

Bypass Channel Mitigation Measures:

- Stream bypass channels will be constructed to temporarily dewater crossings so the existing culverts can be excavated and removed. The bed excavations and culvert installations will be completed in dry channel conditions. The bypass channels will be lined with plastic, riprap, or an equally suitable material to prevent erosion of the channels. The bypass channel liner will extend at least one foot beyond the top of the channel berm to ensure that sediment does not enter the channel.

- The stream will be returned to the new crossing when the original channel work has been completed. All installations will utilize the existing streambeds as much as possible.

- By the end of the project, most of the bypass channel will be covered by the road prism. The remaining portion will be restored.

Culvert Removal and Open Bottom Arch Installation Mitigation Measures:

- The use of equipment in streams will be held to a minimum. Care will be taken to ensure equipment working in or adjacent to streams does not leak hydraulic fluid or fuel. All refueling of equipment will be conducted away from streams. Hazardous material kits and a hazardous materials spill plan will be on site at all times.

- The new open bottom arched culverts will maintain the natural stream gradient. The skew of the arch will be set in such a manner that habitat and channel length are maintained.

- If the main channel cannot be completely de-watered, sediment fences must be installed along the edges of the channel to ensure that sediment does not enter the channel.

- Concrete footings for the arch base must be poured and cured without contact with water. Curing time generally takes one week. If the main channel cannot be completely de-watered, water must be pumped to ensure that it does not contact the footings. It must be pumped upslope onto a vegetated slope in such a manner that the water will not scour or pool on the soil surface. When installed, the footings will be buried sufficiently deep so they will not be exposed to scour.

- To slow the velocity of the stream through the new structure and provide resting sites for fish, the open bottom arch floors will be finished with material excavated from the footings, or suitable riprap. The floors of the crossings will be configured so that fish passage will be unimpeded at all flow levels.

- The finished road fill slopes at each crossing inlet and outlet will be armored with riprap. The completed roadbed will have a crushed aggregate surface.

War Creek Log Removal:

- Logs removed will be cut at the edge of the stream bank, rather than extricating them from the bank.

- Logs that are not barriers to fish passage and are fully embedded within the stream channel may be notched rather than removed.

War Creek Riprap Removal:

- The riprap is composed of angular rocks and once removed will be used in the new culvert installation.

- Once the riprap is removed, the exposed channel bank will be contoured to a natural configuration that matches the downstream natural channel shape.

- Erosion control mats (e.g. jute net) will be used for erosion control on newly disturbed banks. The banks will then be seeded and re-vegetated using the forest seed mix for short-term erosion control, and native shrubs for long-term stability.

Threatened, Endangered, and Sensitive (TES) and Survey and Manage (S&M) Species:

- TES and S&M species surveys will be completed before project implementation and additional mitigation measures implemented if needed. A report will be provided to NMFS before the project begins.

Noxious Weeds:

- Any project equipment that will operate off forest roads must be washed for noxious weeds before entering the National Forest.

- Project area and turn-around areas will be designated and inspected for noxious weed plants that have formed seed heads before project implementation. If seed heads are found, they will be hand pulled or mowed before the project commences.

- If riprap is to be brought in from off-site, the source site will be inspected for noxious weed plants that have formed seed heads and, if present, seed heads removed before riprap is taken from the site.

Restoration Mitigation:

- All disturbed sites will be hydro-seeded and mulched when the project is complete. The Okanogan National Forest seed mix designed for erosion control and discouragement of animal grazing will be used. Native plants and shrubs will be planted along disturbed stream banks in the fall or spring following culvert replacement completion.

1.3 Description of the Action Area

The Action Area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 C.F.R. 402.02).

The Action Area for each culvert replacement extends upstream to the farthest extent of salmonid migration. The precise downstream limit of the Action Area cannot be easily determined because the extent of the effects of the proposed action would vary according to flow stage. The main downstream effects should be negligible at the confluence of each creek with the Twisp River. The Action Area also includes the adjacent riparian zone within the construction area and all areas affected by the project including any staging areas and roadways.

2.0 ENDANGERED SPECIES ACT

2.1 Biological Opinion

2.1.1 Status of the Species

2.1.1.1 Upper Columbia River Steelhead

UCR steelhead were listed as an endangered species under the ESA on August 18, 1997 (62 Fed.

Reg. 43937).

Range-wide factors for the decline of west coast steelhead stocks are primarily attributed to the destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors (Busby et al. 1996). Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (including the Columbia River Basin) have greatly reduced or eliminated historically accessible habitat. Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded (Gregory & Bisson 1997). Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat (NRCC 1996).

Loss of habitat complexity has also contributed to range-wide decline of steelhead. In portions of some national forests in Washington, there has been a 58 percent reduction in large deep pools resulting from sedimentation and loss of pool-forming structures such as boulders and large wood (McIntosh et al. 1994). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead (62 Fed. Reg. 43942; August 18, 1997).

UCR steelhead occupy the Columbia River Basin upstream from the confluence with the Yakima River, Washington, to the United States-Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik 1987). The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers.

Estimates of historical (pre-1960s) steelhead abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size in excess of 5,000 adults for tributaries above Rock Island Dam (Chapman et al. 1994). Recent average total escapement for this stock was 2,400 (62 Fed. Reg. 43949; August 18, 1997). Steelhead in the Upper Columbia River ESU continue to exhibit low abundances, both in absolute numbers and in relation to numbers of hatchery fish throughout the region. Review of the most recent data indicates that natural steelhead abundance has declined or remained low and relatively constant in the major river basins in this ESU (Wenatchee, Methow, Okanogan) since the early 1990s (Busby et al. 1996). Estimates of natural production of steelhead in the ESU are well below replacement (approximately 0.3:1 adult replacement ratios estimated in the Wenatchee and Entiat rivers) (62 Fed. Reg. 43949; August 18, 1997). These data indicate that natural steelhead populations in the Upper Columbia River Basin are not self-sustaining at the present time. There is also anecdotal evidence that resident rainbow trout contribute to anadromous run abundance. This phenomenon would reduce estimates of the natural steelhead replacement ratio (62 Fed. Reg. 43949; August 18, 1997). The primary cause for concern for UCR steelhead is the extremely low estimate of adult replacement rate. The dramatic declines in natural run sizes and inability of naturally spawning steelhead adults to

replace themselves suggest that if present trends continue, this ESU will not be viable (62 Fed. Reg. 43950; August 18, 1997).

The spawning and rearing characteristics of steelhead in the Twisp River Watershed have been documented by the Forest Service (USDA 1994, USDA 2001, and USDA 2002). Steelhead spawn and rear in North Creek up to the culvert at 0.50 mile from the confluence with the Twisp River. Eagle Creek supports steelhead spawning and rearing to the natural barrier falls 0.50 mile from the confluence with the Twisp River. War Creek supports spawning and rearing from the confluence with the Twisp River to the natural barrier falls at 1.25 miles. Scatter Creek supports juvenile rearing up to the culvert at 0.25 mile from the confluence with the Twisp River. Steelhead spawning has not been documented in any of the culvert replacement project areas. However, the lack of documentation does not prove an absence of steelhead spawning because high spring flows and turbidity complicate visual observation.

The Twisp River and its tributaries are thought to support both anadromous and resident forms of *O. mykiss*. Resident forms are usually called rainbow or redband trout. NMFS believes that resident fish can help buffer extinction risks to an anadromous population by mitigating depensatory effects in spawning populations, by providing offspring that migrate to the ocean and enter the breeding population of steelhead, and by providing a "reserve" gene pool in freshwater that may persist through times of unfavorable conditions for anadromous fish. A particular concern is isolation of resident populations by human-caused barriers to migration. This interrupts normal population dynamics and population genetic processes and can lead to loss of a genetically based trait (e.g., anadromy).

For the UCR steelhead ESU as a whole, NMFS estimates that the median population growth rate (lambda) over the base period (1980-1996) ranges from 0.94 to 0.66, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000). NMFS has also estimated the risk of absolute extinction for the aggregate UCR steelhead population, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.25 (Table B-5 in McClure et al. 2000). Assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years is 1.00 (Table B-6 in McClure et al. 2000).

Because of data limitations, the Quantitative Analysis Report (QAR) steelhead assessments in Cooney (2000) were limited to two aggregate spawning groups, the Wenatchee/Entiat composite and the above-Wells populations. Wild production of steelhead above Wells Dam was assumed to be limited to the Methow system. Assuming a relative effectiveness of hatchery spawners of 1.0, the risk of absolute extinction within 100 years for UCR steelhead is 100 percent. The QAR also assumed hatchery effectiveness values of 0.25 and 0.75. A hatchery effectiveness of 0.25 resulted in projected risks of extinction of 35 percent for the Wenatchee/Entiat and 28 percent for the Methow populations. At a hatchery effectiveness of 0.75, risks of 100 percent were projected for both

populations.

2.1.1.2 Upper Columbia River Spring-run Chinook

Upper Columbia River spring-run chinook were listed as endangered on March 24, 1999 (64 Fed. Reg. 14308). The ESU includes all naturally spawned populations of chinook salmon in all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Chiwawa River (spring run), Methow River (spring run), Twisp River (spring run), Chewuch River (spring run), White River (spring run), and Nason Creek (spring run).

The spring run chinook abundance in the Upper Columbia River ESU is quite low with escapements in 1994-1996 the lowest in at least the last 60 years (Myers et al. 1998). At least 6 populations of Upper Columbia River spring chinook salmon in this ESU have become extinct, and almost all remaining naturally spawning populations have fewer than 100 spawners. In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so.

An estimate of the overall run returning to spawn naturally in this ESU can be obtained from counts of adults at Priest Rapids Dam. The 5 year (1990-1994) geometric mean of this dam-count based estimate is approximately 4,880 spawners. Sufficient data were available to estimate trends in abundance for ten populations. All ten short-term trends were downward, with eight populations exhibiting rates of decline exceeding 20 percent per year.

There are no estimates of historical abundance for this ESU. The FCRPS Biological Opinion (NMFS 2000) concluded that significant improvements in the environmental baseline are necessary if this species is to survive and recover. In NMFS 2000, it is estimated that survival must improve from 51 percent to 178 percent if this species is to survive and recover.

Spring chinook spawning and rearing characteristics in the Twisp River Watershed have been documented by the Forest Service (USDA 1994, USDA 2001, and USDA 2002). They spawn and rear up to the culverts in North Creek and War Creek. In Eagle Creek and Scatter Creek juvenile spring chinook were seen rearing below the culverts (USDA 2001).

For the UCR spring chinook salmon ESU as a whole, NMFS estimates that the median population growth rate (lambda) over the base period (1980-1998) ranges from 0.85 to 0.83, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000). NMFS has also estimated median population growth rates and the risk of absolute extinction for the three spawning populations identified by Ford et al. (1999), using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction

within 100 years ranges from 0.97 for the Methow River to 1.00 for the Methow and Entiat rivers
(Table B-5 in McClure et al. 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk
of extinction within 100 years is 1.00 for all three spawning populations (Table B-6 in McClure et al. 2000).

NMFS has also used population risk assessments for UCR spring chinook salmon and steelhead ESUs from the draft QAR (Cooney 2000). Risk assessments described in that report were based on Monte Carlo simulations with simple spawner/spawner models that incorporate estimated smolt carrying capacity. Population dynamics were simulated for three separate spawning populations in the UCR spring chinook salmon ESU, the Wenatchee, Entiat, and Methow populations. The QAR assessments showed extinction risks for UCR spring chinook salmon of 50 percent for the Methow, 98 percent for the Wenatchee, and 99 percent for the Entiat spawning populations. These estimates are based on the assumption that the median return rate for the 1980 brood year to the 1994 brood year series will continue into the future.

2.1.2 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NMFS must determine whether the action is likely to jeopardize the listed species. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the Action Area. If NMFS finds that the action is likely to jeopardize the continued existence of the listed species, then NMFS must identify reasonable and prudent alternatives for the action.

Guidance for making determinations of jeopardy are contained in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids* (NMFS 1999).

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action.

2.1.2.1 Biological Requirements

The first step in the methods NMFS uses for applying the ESA section 7(a)(2) to listed salmon is

to define the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species; taking into account population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its original decision to list the species for protection under the ESA. Additionally, the assessment will consider any new information or data that are relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which time protection under the ESA would be unnecessary. Species or ESUs not requiring ESA protection have: population sizes large enough to maintain genetic diversity and heterogeneity, the ability to adapt to and survive environmental variation, and are self-sustaining in the natural environment. The biological requirements for UCR steelhead and UCR spring chinook include food (energy) source, flow regime, water quality, habitat structure, passage conditions (migratory access to and from potential spawning and rearing areas), and biotic interactions (Spence et al. 1996). For the proposed project, the relevant biological requirement is restored habitat access. Improved access would make habitat available that functions to support successful spawning, incubation, migration, rearing habitat, and over-wintering refugia.

NMFS has related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI). These pathways (Water Quality, Habitat Access, Habitat Elements, Channel Condition and Dynamics, Flow/Hydrology, Watershed Conditions, Disturbance History, and Riparian Reserves) indirectly measure the baseline biological health of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (e.g., indicators for Water Quality include Temperature, Sediment, and Chemical Contamination) that are measured or described directly (NMFS 1996). Based on measurement or description, each indicator is classified within a category of the properly functioning condition (PFC) framework: (1) properly functioning, (2) at risk, or (3) not properly functioning. PFC defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation."

2.1.2.2 Environmental Baseline

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the Action Area that have already
undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process" (50 C.F.R. 402.02).

The Twisp River Watershed is approximately 157,000 acres and is comprised of 95 percent federal land and 5 percent state and private land. Nearly half of the federal land is designated as wilderness with the remaining half designated as Late Successional Reserves (managed for late-

succession and old-growth forest) and Matrix (managed for timber harvest and other silvicultural activities). The private land ownership extends to mile 15 on the Twisp River and influences the river for the lower 15 miles (Andonaegui 2000).

Several factors affect listed salmonids within the Action Area. These include floodplain connectivity, physical barriers to migrating and rearing salmonids, and loss of riparian vegetation. Forest Service and private roads have impaired floodplain connectivity throughout the watershed. The main contributors are The Twisp River road on the North side and a Forest Service road on the South side. These two roads confine and limit natural processes that deliver organic and bedload material to the Twisp River (Andonaegui 2000). There are also physical barriers (i.e. culverts) that impair fish passage throughout a number of the tributaries to the Twisp River such as Scatter Creek, Eagle Creek, War Creek, North Creek, South Creek, Reynolds Creek, and Little Bridge Creek (Andonaegui 2000). In addition, riparian vegetation has been altered through logging, grazing, and various recreational uses. The following is a brief summary that further details the environmental baseline in each sub-watershed.

The Forest Service surveyed North Creek in 1994. They concluded that the riparian habitat is excellent with well-vegetated banks. Good fish habitat exists in the stream segment below the culvert and excellent fish habitat exists above the culvert. Low levels of large wood and pools in the lower half-mile of North Creek are the result of historic logging and mining activities in the drainage and the current culvert blocks large woody debris (LWD) transport. Little management has occurred in the upper segments of North Creek and the lack of wood and pools is probably a natural condition for this high gradient area. The recreation impacts on the North Creek sub-watershed are influenced by the Roads End campground and a number of trailheads in the area as well as the Twisp River road. In addition to recreation, there are mining claims on the west side of North Creek.

The Eagle Creek stream survey data reported that pool habitat was scarce largely because of the lack of LWD creating plunge pools and high channel gradient. Pool habitat that did exist was of good quality. Fish cover was fair to good with hiding cover provided by substrate and vegetation. Riparian habitat conditions were good with well-vegetated banks. Sediment levels were low throughout the 2.1-mile survey. While the slopes in Eagle Creek drainage are naturally stable, there is severe to very severe erosion potential on these slopes when vegetative cover is removed as in the event of a wildfire. The Eagle Creek culvert is undersized for a 100-year flood event and is blocking potential spawning gravel and LWD from being transported downstream. Recreation use on Eagle Creek consists of one trailhead and associated use of Forest Service road 4420.

The Scatter Creek culvert is located within the alluvial fan of Scatter Creek and channel migration is possible above the culvert. If the culvert became plugged, the road would capture the creek, damaging the road and fish habitat below. Recreation has a small impact on Scatter Creek with one small campground and one trailhead in the area and the associated impacts of the Twisp River road.

War Creek stream survey data reported that War Creek riparian habitat was good with well-vegetated banks. Fish habitat was generally good with hiding cover provided by substrate and vegetation. Pool habitat was low because of a lack of LWD in the creek and high channel gradient. Pool habitat that did exist was of excellent quality with most pools over three feet deep. A survey of War Creek conducted by the Pacific Watershed Institute in 2001, found that there are several areas of actively eroding and unstable slopes clustered within the area ¼ mile above the culvert. Although the War Creek culvert is designed to withstand 100 year flood flows, it does not follow the natural gradient or width of the stream and would not likely pass LWD during a flood event (Bennett 2002). The culvert is also blocking potential spawning gravels and LWD from being transported downstream. The only recreation affect on War Creek is the War Creek trailhead and use associated with Forest Service road 4420.

At the Action Area scale the proposed projects will affect several pathway indicators, including sediment/turbidity, physical barriers, LWD, streambank condition, and riparian habitat. While construction activities will result in minor, short term increases in sediment/turbidity, culvert replacement activities will produce long-term improvements in the baseline indicator by restoring natural stream processes. Moreover the project will improve the baseline indicators for physical barriers, LWD, and streambank condition within the project area. Consequently the project will either maintain or improve the environmental baseline at the Action Area scale.

2.1.3 Effects of the Proposed Action

Removal of the existing culverts and installation of new arched culverts, and all related construction activities are likely to adversely affect UCR steelhead and UCR spring chinook. NMFS' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 C.F.R. 402.02). "Indirect effects" are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

2.1.3.1 Direct Effects

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated (USFWS and NMFS 1998).

2.1.3.1.1 Turbidity

Removal of the existing culverts and installation of new arched culverts, and related activities associated with this project, could mobilize sediments and temporarily increase downstream turbidity levels. In the immediate vicinity of the construction area (several hundred feet), the level of turbidity would likely exceed ambient levels by a substantial margin and potentially affect UCR steelhead and UCR spring chinook. The specific activities that will cause the

mobilization of sediments stem from three major project activities including; the diversion of the stream to the bypass channel, excavation of the stream channel, and diversion of the stream back into the main channel. These activities will deliver short term (hours to a few days) pulses of sediment downstream.

For salmonids, turbidity has been linked to a number of behavioral and physiological responses (e.g., gill flaring, coughing, avoidance, increase in blood sugar levels) which indicate some level of stress (Bisson and Bilby 1982, Sigler et al. 1984, Berg and Northcote 1985, Servizi and Martens 1987). The magnitude of the stress responses is generally higher when turbidity is increased and particle size is decreased (Bisson and Bilby 1982, Servizi and Martens 1987, Gregory and Northcote 1993). Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity accelerate foraging rates among juvenile chinook salmon, likely because of reduced vulnerability to predators due to camouflaging.

When the particles causing turbidity settle out of the water column, they contribute to sediment on the riverbed (sedimentation). When sedimentation occurs, salmonids may be negatively impacted in the following ways: (1) salmonid eggs may be buried and suffocated; (2) prey habitat may be displaced; and (3) future spawning habitat may be displaced (Spence et al. 1996).

The proposed culvert replacement would cause elevated turbidity levels during the construction period and for several days afterwards. However, the effects of this turbidity on UCR steelhead and UCR spring chinook would be minimized by working completely in the dry, using sedimentation retention devices, minimizing channel disturbance, and observing all water quality protection BMP's. It is also expected that UCR steelhead and UCR spring chinook present during the initial phases of construction would temporarily move to refuges where turbidity can be avoided, thus lowering the likelihood of injury or death. Additionally, the project work window will capitalize on a time of year when neither spawning fish nor redds are present.

NMFS expects that the turbidity and sedimentation caused by this action would be short lived, returning to baseline levels soon after construction is over. Furthermore, NMFS expects that long term impacts would not occur. Other than the short term impacts mentioned above, this project would not change or add to existing baseline turbidity or sedimentation levels within the Twisp River or any of its tributaries.

2.1.3.1.2 Streambed and Bank Disturbance

The replacement of the culverts would disturb the existing substrate present in the river and require a small amount of bank disturbance. The primary mechanisms of disturbance would be the construction of the bypass, the diversion of the stream into the bypass channel, and alteration of the river stream bottom. The direct effects on UCR steelhead and UCR spring chinook are likely to be minor. Because of the project work window UCR steelhead and UCR spring chinook lifestages present in the Action Area include juvenile and young-of-the-year fish that should be able to evacuate the area when disturbance is initiated. In addition, the Forest Service will be implementing numerous minimizing measures and activities that are included in the proposed action to reduce the effects to listed salmonids.

2.1.3.1.3 Diversion of Stream and Removal of Fish

The diversion of each stream may result in the stranding of fry and juvenile salmonids. Additionally, the diversion of water in the channel will impede salmonid movements. The effects of dewatering will be reduced by gradual dewatering, enabling fish to move with the receding water.

Diverting water will also cause the temporary loss (burial, dessication, and displacement) of macroinvertebrate habitat. Aquatic invertebrates serve as an important source of prey for salmonids, and the loss of their habitat through burial, dessication, or displacement may reduce foraging opportunities for listed salmonids. Effects associated with the disruption of the streambed likely would be short-lived as new invertebrates tend to recolonize disturbed areas (Allan 1995). In the Action Area of each stream, recolonization rates are expected to be rapid due to the small size of the disturbance and relatively short time period of construction activities.

Fish will be removed from the construction area in the following manner (developed from RRMTWG, 2000). A block net will be installed at the upstream terminus of the construction area. A crew will then drag a seine through the entire construction area, beginning at the upstream block net. A second block net will then be installed at the downstream terminus of the construction area. If listed fish are stranded between the block nets, they will be removed by hand or with dip nets, placed in buckets, and released downstream of the construction area.

2.1.3.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action. Indirect effects may include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or be a logical extension of the proposed action.

2.1.3.2.1 Riparian and Fisheries Habitat

The culvert replacement will result in a minor, short term loss of riparian function caused by the removal of vegetation. The decreased riparian vegetation affects riparian habitat functions such as shading and organic matter inputs to the stream. However under the proposed action, the loss of riparian function should be minimal because of the small footprint of each project. Few, if any, large trees will need to be removed. Therefore, LWD recruitment is not expected to be significantly reduced by the proposed project. Vegetation loss will be mitigated by seeding with native plant stock and riparian planting that will provide additional long term cover for fish. The negative effects of these activities on UCR steelhead, UCR spring chinook, and aquatic habitat indicators will be limited by implementing construction methods and approaches included in the project design, BMP's, and by following the terms and conditions in section 2.2.3 of this BO.

2.1.3.2.2 Construction Equipment

As with all construction activities, accidental release of fuel, oil, and other contaminants may occur. These contaminants could injure or kill aquatic organisms if spilled into a water body or the adjacent riparian zone. However, all equipment fueling and maintenance would occur in designated staging areas at least 150 feet from the stream channel.

2.1.3.3 Population Level Effects

Construction of the four culverts in the Twisp River Watershed will result in short term impacts to listed salmonids. Conservation measures and BMP's are expected to reduce the potential for harm to listed fish by reducing the effects of turbidity, streambed and bank disturbance, and fish removal. Therefore, the proposed action is unlikely to adversely influence population growth trends or risks for UCR steelhead or UCR spring chinook.

2.1.4 Cumulative Effects

Cumulative effects are defined as "those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the Action Area of the Federal action
subject to consultation" (50 C.F.R. 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Gradual improvements in habitat conditions for salmonids are expected on federal lands as a result of Northwest Forest Plan implementation. Significant improvements in UCR steelhead and UCR spring chinook salmon production outside of the Forest Service is unlikely without changes in forestry, agricultural, and other practices occurring with non-Federal riparian areas. NMFS is aware that significant efforts, such as the Salmon, Steelhead and Bull Trout Habitat Limiting Factors Report (2000), have been developed to improve conservation and restoration of steelhead and chinook salmon habitat on non-Federal land. Local improvements to currently degraded habitat conditions may occur as a result of culvert replacements and riparian restoration projects in the Twisp River Watershed.

NMFS assumes that future private and state actions will continue at similar intensities as in recent years. As the human population in the state continues to grow, demand for actions similar to the proposed project likely will continue to increase as well. Each subsequent action by itself may have only a small incremental effect, but taken together they may have a significant effect that would further degrade the watershed's environmental baseline and undermine the improvements in habitat conditions necessary for listed species to survive and recover.

2.1.5 Conclusion

NMFS has reviewed the direct, indirect, and cumulative effects of the proposed action on UCR steelhead and UCR spring chinook. NMFS analyzed the proposed action and found that it would cause minor, short-term adverse effects to salmonid habitats due to in-water work and riparian vegetation removal. The project might have short term effects causing harm of listed salmonids.

However, over the long term, the proposed action is expected to maintain stream habitat conditions while improving fish passage within the Action Area. As such the proposed action in unlikely to negatively influence present population growth trends or risks. Consequently, the proposed action is not likely to jeopardize the continued existence of UCR steelhead or UCR spring chinook.

2.1.6 Reinitiation of Consultation

This concludes formal consultation for the Twisp River Watershed Culvert Replacements. Consultation must be reinitiated if: (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed that may be affected by the action (50 C.F.R. 402.16). To reinitiate consultation, the Forest Service should contact the Habitat Conservation Division, Washington Branch Office of NMFS.

2.2 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct of listed species without a specific permit or exemption (50 C.F.R. 217.12). "Harm" is further defined by the NMFS Final Rule to include significant habitat modification or degradation that results in death or injury to listed species by "significantly impairing essential behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering" (50 C.F.R. 222.102). "Incidental take" is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action, is not considered prohibited taking provided that such takings is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

2.2.1 Amount or Extent of Take Anticipated

NMFS anticipates that incidental take of UCR steelhead and/or UCR spring chinook is reasonably likely to result from the project activities described in the BA. Despite the use of the best scientific and commercial data available, NMFS cannot estimate a specific amount of incidental take of individual fish. However, NMFS believes that there are several mechanisms through which take of UCR steelhead and UCR spring chinook may occur. Direct harm may result from installation and construction activities (e.g., sediment mobilization, stream

dewatering, and short term loss of riparian habitat). Indirect harm, through long term habitat modification could occur if the minimizing measures (i.e., BMPs) are disregarded.

2.2.2 Reasonable and Prudent Measures

The following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize take of UCR steelhead and UCR spring chinook. These RPMs are partially integrated into the BA and proposed project. NMFS has included them here to provide further detail as to their implementation.

1. To minimize the amount and extent of incidental take from construction activities, measures shall be taken to limit the duration and extent of construction within the ordinary high water mark (OHWM) and to time such work that the impacts to UCR steelhead and UCR spring chinook are minimized.

2. To minimize the amount and extent of incidental take from construction activities in or near the creek, effective erosion and pollution control measures shall be used the area of disturbance and for the life of the project. The measures shall minimize the movement of soils and sediment both into and within the creek, and stabilize bare soil over both the short term and long term.

3. To minimize the amount and extent of take from loss of instream habitat, measures shall be taken to minimize impacts to riparian and instream habitat, or where impacts are unavoidable, to replace or restore lost riparian and instream function.

4. To ensure effectiveness of implementation of the RPMs, fish passage through the culvert, erosion control measures and plantings for site restoration shall be monitored and evaluated both during and following construction, and meet criteria as described below in the terms and conditions.

2.2.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Forest Service must comply with the following terms and conditions, which implement the RPMs described above. Implementation of the terms and conditions within this BO will further reduce the risk of impacts to UCR steelhead and UCR spring chinook. These terms and conditions are non-discretionary.

1. To implement RPM No. 1 (construction within the OHWM) above, the Forest Service shall ensure that:

1.1 All work within the active channel will be completed between July 1 and August 31. Any additional extensions of the in-water work period will first be approved by, and coordinated with NMFS and WDFW.

1.2 Alteration or disturbance of stream banks and existing riparian vegetation will be minimized by implementing the following procedures: any instream large wood or

riparian vegetation that is moved or altered during construction will stay on site or be replaced with a functional equivalent; all tree removal will be mitigated for onsite by a 2:1 ratio; and any native channel material, topsoil, and vegetation removed will be stockpiled for redistribution in the project area.

1.3 Any water diversion structure constructed for the purpose of supplying water for construction or for riparian plantings will be designed and monitored to pass juvenile salmonids. Water withdrawal rates from waters containing listed fish will not exceed 1 percent of the flow of the supply stream and pump intakes will be properly screened. Additionally, the Forest Service shall be responsible for informing all contractors of their obligations to comply with existing, applicable statutes.

2. To implement RPM No. 2 (construction activities), the Forest Service shall ensure that all erosion and pollution control measures included in the BA are included as special provisions in the contract. The Forest Service will ensure preparation and use of an erosion control plan (ECP). Erosion control measures shall be sufficient to ensure compliance with applicable water quality standards and this BO. The ECP shall be maintained on site and shall be available for review upon request.

2.1 Erosion control measures shall be in-place at all times during the construction period. Construction within the project vicinity will not begin until all temporary erosion controls (e.g., sediment barriers and containment curtains) are in place.

2.2 All exposed areas will be replanted with a native seed mix. Erosion control planting will be completed on all areas of bare soil before October 31, 2002.

2.3 All equipment used for in-water work will be cleaned prior to entering the active channel. External oil and grease will be removed. Untreated wash and rinse water will not be discharged into streams and rivers without adequate treatment.

2.4 The Contractor will develop an adequate, site-specific Spill Prevention and Countermeasure or Pollution Control Plan (PCP), and is responsible for containment and removal of any toxicants released. The Contractor will be monitored by the Forest Service to ensure compliance with this PCP.

2.5 Areas for fuel storage, refueling, and servicing of construction equipment any vehicles will be at least 150 feet from the stream channel and all machinery fueling and maintenance will occur within a contained area. Overnight storage of vehicles and equipment must also occur in designated staging areas.

2.6 No surface application of nitrogen fertilizer will be used within 50 feet of any water of the State, in the action area.

3. To implement RPM No. 3 (riparian habitat protection), the Forest Service shall ensure that:

3.1 Alteration of native vegetation will be minimized. No protection will be made of invasive exotic species (e.g., Himalayan blackberry), although no chemical treatment of invasive species will be used.

3.2 Except within the footprint of the new culvert, riparian vegetation removed will be replaced with a mix of native seeds, shrubs, and trees. Replacement will occur within the project vicinity at a replanting ratio of 2:1.

3.3 Fencing will be installed as necessary to allow new plantings to establish and prevent trampling by livestock or humans.

4. To implement RPM No. 4 (monitoring), the Forest Service shall ensure that:

4.1 Monitoring for Fish Passage Conditions: Culvert replacements will be monitored by qualified personnel for passage of the target fish species and life history stage during summer, high (greater than or equal to the 5-year flow event) and bankfull discharge. Monitoring shall document the hydraulic conditions (depth, velocity, and flow) around and through the structure. In the event that the project does not meet the depth, velocity, and flow standards to allow passage of the target fish species and life history stages, the Forest Service shall implement corrective actions necessary to allow fish passage of the target species at the project site.

4.2 Erosion control measures as described above in RPM No. 2 shall be monitored.

4.3 All significant riparian planting areas will be monitored to ensure that finished grade slopes are at stable angles of repose and plantings are surviving satisfactorily (80 percent survival over three years).

4.4 Failed plantings will be replaced for a period of three years. If successive plantings have failed the Forest Service will replant an equally sized area in the project vicinity.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));
- NMFS must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A));
- Federal agencies must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a

description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 C.F.R. 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 C.F.R. 600.810).

EFH consultation with NMFS is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

3.2 Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed action and Action Area are detailed above in Sections 1.2 and 1.3 of this document. The Action Area includes habitats that have been designated as EFH for various life-history stages of chinook and coho salmon.

3.4 Effects of Proposed Actions

As described in detail in Section 2.1.5 of this document, the proposed action may result in detrimental short- and long-term impacts to a variety of habitat parameters. These adverse effects are:

3.4.1 Short term degradation of water quality in the Action Area due to an increase in turbidity during in-water construction.

3.4.2 Short term degradation of habitat due to removal of riparian trees and vegetation.

3.4.3 Short term and possible long term compaction and disturbance of instream gravel from heavy equipment.

3.4.4 Short term delivery of toxic or harmful substances into the waterway.

3.5 Conclusion

NMFS believes that the proposed actions may adversely affect EFH for chinook and coho salmon.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. While NMFS understands that the conservation measures described in the Biological Assessment will be implemented by the Forest Service, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. However, the Terms and Conditions outlined in Section 2.2.3 of this document are generally applicable to designated EFH for chinook and coho salmon and address these adverse effects. Consequently, NMFS recommends that they be adopted as EFH conservation measures.

3.7 Statutory Response Requirement

Since NMFS is not providing conservation recommendations at this time, no 30-day response from the Forest Service is required (MSA §305(b)(4)(B)).

3.8 Supplemental Consultation

The Forest Service must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 C.F.R. 600.920(k)).

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